in colours. Yet why should one regret that a region of such preeminent scenery lies comparatively near us, and is at times unconformably overstepped by the non-geological tourist? The next series of papers carries us away to Styria and the valley of the Mur, where miles of torrent and ravine, of grey limestone crag above and sunny maize below, await the unconventional traveller, and lure him ever eastward, until he emerges on the plain of Hungary. Then follows a number of papers on the environs of Vienna, a city set so happily in a land of geological contrasts. Until we have seen and touched it, we scarcely realise that, a few miles south of Laxenburg, the dusty rise over a castle-crowned projection represents the passage of the Alps. South-west lies the true mountain-episode of the Semmering, fully expounded, with a fine map, by Franz Toula. Westward, we have the narrows of the Danube, and the variety of cliff and alluvial meadow so charmingly described by Prof. Penck. The river runs between Melk and Krems in a pre-Glacial valley, much of which was actually excavated before Oligocene times. The surface-features must originally have been very different, to allow of the formation of this deep cut across the southern projection of crystalline rocks, which almost connects Bohemia with the Alpine system.

The Dolomites, the Adige valley, and Predazzo still offer problems for many a friendly battle. The Carnic Alps present a newer field, and include the superb ravine of Pontebba, with a side-excursion to the limestone-fastness of the Predil. This comparatively low pass, with its fine angle on the south side, amid a veritable world of rocks, would in itself show how much awaits the tourist who will venture east of Venice.

Hungary will probably be dealt with in a special treatise for those who made the long excursion on the Danube. Bosnia and the Hercegovina are very briefly touched on, since the local government has prepared a separate "souvenir" for visitors. What this attention means will be appreciated by those who have experienced the hospitality of the "occupied provinces." From a congress down to the humble bicyclist, all receive a welcome in this old Slavonic highland, all visitors alike are considered of interest to the State. When one sits by the stream-side in some level *polje*, a lake-basin of Miocene times, and hears the muezzin call from the little wooden mosque among the trees, or when one chips the gabbros in the grim ravine of the Narenta while sun-browned hill-men, like stage-bandits, stride gravely past upon the road, then one can realise, with a grateful heart, what Austria-Hungary means, not only to the geologist, but to Europe.

GRENVILLE A. J. COLE.

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## NOTES.

A COMMISSION has been appointed by the French Navy Board to inquire into the migrations of the sardine and the causes of the disappearance of this fish. The commission includes Prof. Vaillant, of the Paris Natural History Museum; M. Fabre Domergue, Inspector-General of Sea Fisheries; and M. Canu, director of the agricultural station at Boulogne-sur-Mer.

OWING to the appointment of Dr. Martin to the directorship of the Lister Institute, the chair of physiology is vacant at the University of Melbourne. Particulars as to duties, emoluments, &c., will be in the hands of the Agent-General for Victoria after October 8. The new professor will be required to commence his duties on March 1, 1904.

AN international exhibition of the manufacture and industrial applications of alcohol will be held in Vienna in April and May, 1904.

A PRESS despatch from Berlin states that the Imperial budget for 1904, now in preparation, allots 7500*l*. for combating typhus, which is specially virulent in Bavaria, Prussia and Alsace-Lorraine.

AN international congress on school hygiene is to be held at Nuremberg from April 4–9, 1904, under the presidency of Prof. Griesbach, of the University of Strassburg. The general secretary is Dr. Paul Schubert, to whom all communications relative to the congress should be addressed.

A REUTER telegram from Rio de Janeiro of October 1 states that the Brazilian Chamber has adopted the third reading of the Bill to establish an international steerable balloon competition to be held at Rio in 1904. The scheme has been submitted to the Senate.

MR. H. MAXWELL LEFROY, who has been appointed entomologist to the Government of India, is to be stationed at Surat, in the Bombay Presidency, pending the establishment of the permanent headquarters of the Imperial Agricultural Department now being organised under the orders of Lord Curzon.

THE necessary legal formalities in connection with the change of name of the Jenner Institute have now been completed, the Board of Trade having sanctioned the new name. The Institute will, therefore, now be known as the "Lister Institute of Preventive Medicine." The address, Chelsea Gardens, S.W., remains the same.

SIR THOMAS HANBURY has promised the Pharmaceutical Society of Great Britain securities of the annual value of 25*l*. for presentation with the Hanbury gold medal awarded biennially for research in the natural history of drugs. The medal, founded in memory of Daniel Hanbury, brother of Sir Thomas, was awarded this year to M. Eugène Collin, of Paris. As the result of Sir Thomas Hanbury's gift future recipients of the medal will also receive the sum of 50*l*.

A PROVISIONAL programme of the ordinary meetings of the Royal Geographical Society for the session 1903–4 has been published. Among the subjects to be dealt with in the meetings of this year we notice north polar exploration, 1898–1902, by Commander R. E. Peary, and the Patagonian Andes, by Colonel Sir T. H. Holdich. The arrangements made for meetings after Christmas include, among others, the Gulf Stream, by Mr. H. N. Dickson; the régime of the Nile, by Sir William E. Garstin, G.C.M.G.; the lakes of New Zealand, by Mr. Keith Lucas; and some adventures in Antarctic lands and seas, by Lieutenant E. H. Shackleton (Christmas lecture to young people).

A KITE-FLYING competition was held at the Alexandra Palace on Saturday last under the auspices of the Aëronautical Institute. The length of wire or string to be used was limited to one mile, and marks were awarded on the following points:—(*a*) The manner in which the kite leaves the ground; (*b*) the manner in which it ascends; (*c*) the steadiness of the kite; (*d*) the length of time required to let out the whole mile of wire or string; (*e*) the greatest average of the altitude as taken by a series of observations during the course of one hour; and (*f*) the rapidity and manner of descent. Only three competitors put their kites to the test, and the contest was easily won by Mr. S. F. Cody, whose kite quickly reached the limit distance and remained steady at that altitude in a strong wind. The kite used was one of a number which is being prepared for consignment to Portsmouth Dockyard.

AN influentially signed memorial on the subject of the improvement of agriculture was recently sent to the Government of Bombay, and is summarised in the *Pioneer Mail.* The memorialists propose that two botanic gardens should be established, one at Poona and one near Bombay, the former as the centre of investigation for the Deccan, and the latter for the Konkan and Gujarat. Each garden should be provided with a herbarium and with chemical and botanical laboratories, and to each should be attached a farm for agricultural and horticultural experiments. It is suggested that the scientific staff might be one chief botanist, one assistant botanist for Poona, one assistant botanist for Bombay, one chemist, one entomologist, and one mycologist. It is also suggested that the number of the experiment stations should be increased and the scope of the experiments extended; that local bodies should be encouraged by grants in aid to conduct experiments on lines prescribed by the department; that publicity should be given to the work of the department, and results of practical interest should be communicated through leaflets printed in the vernacular; that further measures for the improvement of agricultural stock should be taken by the State; and that the Forest Department should be invited to cooperate with the Agricultural Department in the work of experimenting with products likely to succeed in forest areas.

THE method of scientific investigation by observation and experiment was touched upon by Mr. Sidney Lee at the Working Men's College on Saturday last, in the course of a lecture on Bacon, who advocated and inaugurated the revival of experimental philosophy. Bacon's main anxiety, said Mr. Lee, was to see research in every branch of science adequately endowed and equipped, and in his "New Atlantis" he planned in somewhat fanciful language a great palace of invention, a great temple of science, where the pursuit of knowledge in all its phases was to be organised on principles of the highest efficiency. Whether a temple of science on the scale that Bacon imagined it would ever come into existence remained to be seen. At present the portents were not favourable for its emergence in this country. It seemed more likely to come first to birth in Germany or in America, where things of the mind received from the general public a consideration which was denied them here. The experience of a recent visit to America showed Mr. Lee that there was nothing here to compare with the widespread eagerness among the youth of the United States to enjoy academic scientific training. England's prestige owed very much to the triumphs won by men who were Bacon's disciples in methods of scientific research, many of whom stood indebted to ancient educational benefactors. Bacon was well alive to the means whereby a nation's intellectual prestige could best be sustained. He argued that for a nation to apply a substantial part of its material resources to the equipment of scientific work and exploration, a share of its resources which should grow greater with the growth of population and the increasing complexity of knowledge, was the surest guarantee of national glory and prosperity.

IN the report of observations made at the Bombay Government Observatory in the years 1900 and 1901, a feature which differentiates it from the reports of previous years is the prominence given to records obtained from seismographs. In the previous report a series of seismograms and a register of disturbances obtained from a Milne seismograph were given. These are now supplemented by similar information derived from a pair of heavy horizontal pendulums, which record with ink on a metal cylinder, and which have a sensibility for tilting three or four times that of the Milne apparatus. The chief differences in the records obtained from these two types of instruments are the ratios of the recorded amplitudes. These differ so widely that it may be inferred that "the dominant feature of the movements in the majority of disturbances does not indicate tilt." We are not told, however, whether the free periods of the three horizontal pendulums are identical or different.

M. E. ESTANAVE contributes to the *Journal de Physique* a list of the theses in mathematical and experimental physics presented for the doctorate of science in French universities during the nineteenth century.

MR. P. E. JOURDAIN contributes a note on Gauss's principle of least constraint to the *Mathematical Gazette*, and a general theorem on the transfinite cardinal numbers of aggregates of functions to the *Philosophical Magazine* for September.

A COMPARISON of Maxwell's theory with the older and newer theories of electromagnetism is given by Mr. Emil Cohn in the *Physikalische Zeitschrift* for September. It is pointed out among other conclusions that Maxwell's theory accounts in the simplest way for those phenomena which it is competent to explain.

IN a note contributed to the Lombardy *Rendiconti*, Prof. M. Cantone discusses the question whether the elastic constants of a substance are affected by the surrounding medium. The results obtained negative the idea of any such connection. In determining the torsional rigidity of platinum and caoutchouc filaments, the immersion of the filament in water produced no deviation in the torsion balance.

IN the *Proceedings* of the Physical Society, Dr. G. J. Parks describes some experiments on the thickness of the liquid film formed by condensation on the surface of the solid. In the case of cotton silicate, it was found by weighing the material before and after condensation that the thickness of the film came out to be about $13{\cdot}4 \times 10^{-6}$ of a centimetre, and when the film had reached this thickness no heating was produced on immersing the silicate in water.

THE *Journal* of the Western Society of Engineers contains a description of the latest experiments in aërial gliding by Mr. Wilbur Wright. A noticeable feature of these experiments is that the machine sustained as much as 165 lb. to the horse-power as contrasted with 28 in Mr. Maxim's machine and 31 in Prof. Langley's model of 1896. Furthermore, while Mr. Chanute's best experiments in 1896 gave angles of descent of 7½ to 11 degrees, Mr. Wright has succeeded in gliding at angles of 6 to 7 degrees, and even, in one case, at as low an angle as 5 degrees.

IN the *Rivista d'Italia*, Mr. Italo Giglioli, director of the agricultural station at Rome, deals with certain agricultural questions affecting the south of Italy. After reviewing the principal vegetable products now produced by Italy the author suggests, as possible outlets for fresh enterprise, the cultivation of (1) the camphor plant (*Laurus camphora*); (2) the insecticide *Pyrethrum cinerariaefolium*; and (3) the india-rubber plant (*Ficus elastica*). The author sees no reason why the production of india-rubber in Italy should not be a success.

PROF. ALESSANDRO VOLTA, in a note appended to a paper in the Lombardy *Rendiconti,* directs attention to an unpublished manuscript of Volta in which it is stated that negative electricity is dissipated with three times the facility of positive electricity. It thus appears that the difference of the two electricities in their behaviour in electric discharges was known to Volta. Attention is also directed to remarks by Volta on flame discharges, in which it is asserted that such discharges are not affected by the smoke produced. Prof. A. Volta's own researches show that flames of oil, petroleum, gas, and alcohol have approximately the same resistance, but for alcohol flames containing copper chloride the resistance is lower.

THE August number of the *Journal* of the Royal Microscopical Society is mainly devoted to optical theories of the microscope. This subject is introduced by a paper on Helmholtz's theory by Mr. J. W. Gordon, in addition to which Lord Rayleigh's paper from the *Philosophical Magazine* of 1896 is reprinted, together with a further communication from the same writer, and remarks by Dr. Johnstone Stoney, Dr. Siedentopf and others are reported in the Society's *Proceedings*. Among important points under discussion is the property that there is no theoretical limit to the smallness of an isolated luminous object which can be visible through the microscope. The limitations imposed by the undulatory theory affect only the distance apart of two objects or the fineness of structures in order that they may be capable of resolution.

WE have received a circular issued under the auspices of the German Ornithological Society, and signed by Mr. J. Thienemann, of Rossitten, Keer, Nehrung, East Prussia, directing attention to an experiment about to be made with the view of increasing our knowledge of the seasonal wanderings of birds. During the present autumn and next spring it is proposed to capture at Rossitten some hundreds, or perhaps thousands, of rooks (or crows?), upon the foot of each of which is to be fastened a metal ring bearing a number and the date of capture, after which the birds are to be set at liberty. Whenever such marked birds are killed, it is requested that the leg bearing the ring may be cut off and forwarded to Rossitten, with a label recording the date and place of capture.

THE latest issue (vol. xxxi. parts ii. and iii.) of Gegenbaur's *Morphologisches Jahrbuch* appears in mourning on account of the death, in June last, of its learned founder, who superintended the journal nearly to the completion of the twenty-ninth volume. A full biography is promised in the next number. Among the contents of the present issue is an article on the comparative anatomy and development of the heart and aorta in vertebrates, by Mr. A. Greil, and a second, by Dr. K. Fürbringer, on the visceral skeleton of sharks and rays. In a third, Mr. K. Gehry demonstrates that the bunch of axillary muscles ("Achselbogen") in man really represents the panniculus carnosus of lower mammals.

THE first part of the "Aarbog" of the Bergen Museum is devoted entirely to descriptions of the invertebrate fauna of Norway and its seas. Miss E. Arnesen contributes the second instalment of her account of the sponges, dealing in this section with the halichondrine group of the Monaxonida. The nemertean worms are described at considerable length by Mr. R. C. Punnett, of Cambridge, who records a number of new species collected by himself and Dr. Nordgaard in the fjords round Bergen in the summers of 1901 and 1902. Another article, by Mr. E. T. Browne, of University College, London, deals with medusas from Norway and Spitsbergen, among which are several novelties.

WE have received vol. xxxiii. part ii. of *Travaux de la Société Impériale des Naturalistes de St. Pétersbourg*. Its contents include an article on biological method in "zoo-psychology," by Mr. W. Wagner, a second, by Mr. H. Goebel, on the birds of Lapland and the Solovetski Islands, and a third, by Mr. K. St. Hilaire, on the change of substance in cells and connective tissue. The latter article is largely based on the acid-secreting glands of molluscs. As regards the birds of Lapland, the author finds that out of a total of 198 species, 133 are certainly known to breed in that country, while another 34 probably do so. Of the remainder, 17 are stragglers and 6 winter visitors, while 1 is a pelagic species, and the other 7 are found only in the Solovetski Islands.

THE September number of *Animal Life* contains an article by Mr. Lydekker on local variation in the giraffe, illustrated by one coloured plate and a number of photographic reproductions from paintings. After referring to the marked differences between the Somali giraffe (*Giraffa reticularis*) and the typical *G. camelopardalis*, the author points out that evidence is gradually accumulating as to the existence of a number of local races of the latter. The article is chiefly based upon specimens now, or recently, living in the Duke of Bedford's collection at Woburn and in the Zoological Society's Gardens, and on two mounted examples in the Natural History Museum. The Woburn and Regent's Park forms are definitely identified, but, owing to the unsatisfactory nature of the description of two subspecies founded by a German writer, the author has refrained from giving names to the British Museum specimens, which clearly indicate distinct races. A name is, however, assigned to the Congo giraffe.

AN official report has been issued in Simla on the mortality caused by wild beasts and snakes in India. In 1902 the total mortality caused by wild animals was 2836, of which 1046 are reported as being due to tigers, and deaths reported from snake-bite numbered 23,166. In addition 80,796 cattle were destroyed by wild animals, and 9019 by snakes. The number of wild animals for the destruction of which rewards were paid in 1902 was 14,983, of which 1331 were tigers; the number of snakes killed was 72,595. The amount paid in rewards for the destruction of wild animals was Rs. 1,00,987, and for the destruction of snakes Rs. 3529.

A NOTABLE contribution to the subject of proteid metabolism is made by Mr. E. Godlewski in a paper which appears in the *Bulletin international de l'Académie des Sciences de Cracovie*. The general conclusions arrived at are that flowering plants, *i.e.* germinating seedlings as well as fungi, can, in the dark and in an atmosphere devoid of $CO_2$, absorb and work up nitrogen from nitrates even to the extent of building up proteid substances; but for the continued formation of proteids to any considerable extent a supply of plastic carbohydrate must be present in order to furnish the energy required, such, for instance, as the sugar or starch present in germinating tubers or bulbs. Also, according to the author, light has a direct as well as an indirect action in increasing the amount of proteid substances formed.

A SMALL brochure on "Propagating Plants," written by Mr. D. S. Fish, of the Royal Botanic Garden, Edinburgh, will be found useful by amateur gardeners who wish to obtain practical information on the methods of raising seedlings, striking cuttings, and similar matters. It is published by Messrs. Dawbarn and Ward, London.

THE "Guide to the Sydney Botanic Gardens," which has been prepared by the director, Mr. J. H. Maiden, with assistance from other members of the staff, bears witness to the wealth of vegetation which has been planted round

Farm Cove, a bay in the famous harbour of Port Jackson. The collections of cycads and conifers, including nearly a dozen species of both Macrozamia and Podocarpus, are particularly noteworthy. The plan adopted in the "Guide" is to give a list of the important plants to be found in each bed, with brief notes on native and the more interesting foreign species.

Two handy little publications have been issued by Messrs. James Woolley, Sons, and Co., Ltd., of Manchester. One, known as the "Science Teacher's Pocket Book and Diary, 1903–4," costs a shilling, and the other, the "Science Student's Note Book, 1903–4," costs 6*d*. Both books contain about forty pages of useful constants in physical and chemical science, together with other numbers in constant use in the laboratory.

Messrs. Aston and Mander are now manufacturing for the use of technical and other schools drawing instruments provided with several useful improvements. The adjusting screws cannot be detached from the instruments, and so be lost, the inking-in pens are easily cleaned, and a patent hook-and-nut method of holding the needles effectually prevents breakages when clamping, and renders it easy to change the needles.

Several volumes of the first annual issue of the "International Catalogue of Scientific Literature" have recently been received. The volume on chemistry (part ii.) contains 671 pages, referring to papers published since the end of 1900. The literature published in 1901, together with a portion of that published in 1902, is catalogued in the volumes on palæontology, general biology, human anatomy, physical anthropology, and physiology (part ii.); the last volume includes papers on experimental psychology, pharmacology, and experimental pathology, and occupies 664 pages.

Copies have been received of the last two half-yearly volumes—xxxii. and xxxiii.—of the *Journal* of the Anthropological Institute of Great Britain and Ireland. Among numerous other important contributions, the earlier volume contains the Huxley lecture for 1902, on right-handedness and left-brainedness, by Prof. D. J. Cunningham, F.R.S. The more recent volume includes the address by the president, Dr. A. C. Haddon, F.R.S., delivered at the annual general meeting of the Institute in January last. The volumes are profusely illustrated with beautifully reproduced plates, and serve to show the excellent work the Institute is doing. Similar researches are, in the United States and elsewhere, liberally subsidised by the State, but the Anthropological Institute, working without such support, is enriching the Empire by collecting and publishing a mass of well-arranged information of which any scientific department might legitimately be proud.

The additions to the Zoological Society's Gardens during the past week include a Chimpanzee (*Anthropopithecus troglodytes*) from the Albert Nyanza, a Patas Monkey (*Cercopithecus patas*) from Gondokoro, presented by Colonel Bruce; two Geoffroy's Cats (*Felis geoffroii*) from Chaco, Argentina, presented by Mr. A. C. Crewe; a Puma (*Felis concolor*), two Vicunas (*Lama vicugna*), a Condor (*Sarcorhamphus gryphus*) from Puna de Jujuy, presented by Baron Ott; a Rosy-faced Love-bird (*Agapornis roseicollis*) from South Africa, presented by Mrs. Healey; a Mandarin Duck (*Æx galericulata*) from China, presented by Mrs. Balston; two Wagler's Pit Vipers (*Lachesis wagleri*) from Singapore, presented by Mr. A. Herbert; a Back-marked Snake (*Coluber scalaris*), European, presented by Mr. W. A. Harding; four Horned Lizards (*Phrynosoma cornutum*) from Colorado, presented by Mr. Edwin Webb; two Carinated Lizards (*Liocephalus carinatus*) from the West Indies, five Hispid Lizards (*Agama hispida*) from South Africa, five Round-spotted Lizards (*Stenodactylus guttatus*) from North Africa, five Black-spotted Lizards (*Algiroides nigropunctatus*) from the Borders of the Adriatic, two Wall Lizards (*Lacerta muralis*, var. *genéi*), two Wall Lizards (*Lacerta muralis*, var. *bedriagoe*) from Corsica, two Alaska Geese (*Bernicla minima*) from the Pacific Coast, deposited.

## OUR ASTRONOMICAL COLUMN.

The Rotation of Saturn.—Writing to the October number of the *Observatory*, Herr Leo Brenner states that the rotation period of Barnard's large white spot on Saturn, as deduced from his observations, is *exactly* 10h. 38m., and that this value is rigidly confirmed by the observations of other German observers.

This period exactly agrees with that obtained by Mr. Denning as a mean of all the published observations, and, as that observer points out in a communication to the above-named journal, it indicates that the various belts and zones on Saturn have different rotation periods in a manner similar to those of Jupiter.

The recent disturbances on Saturn have now practically subsided, and can only be seen with the larger instruments.

The Broadening of Spectral Lines.—In a paper communicated to No. 34 vol. vi. of the *Philosophical Magazine* Mr. G. W. Walker discusses the causes which lead to the asymmetrical widening of spectral lines.

Taking it for granted that near to a luminous source, whether the luminosity be produced by electricity or by flame at high temperature, there must be a number of free negatively charged particles, he proceeds to show how these particles may modify the light which they receive, and again scatter it in a manner quite different to that obtaining in the "Doppler" or in any "damping" effect. These charged particles, under the influence of the plane waves, will then vibrate with a period different from that of the incident waves; thus, instead of homogeneous light, there will be a portion of the light scattered by the charged particles, and this portion will have a longer wave-length than the original light, its intensity varying in proportion to the number of freely charged particles present. This, however, does not account for those rare cases where the broadening takes place on the violet side of the normal line. To explain these cases Mr. Walker suggests that the continuous streams of charged particles will set up a magnetic field which may produce the Zeeman effect, in which Zeeman has frequently noted asymmetrical broadening towards the violet. Where this latter effect is greater than the former, then the broadening takes place on the violet edge of the original line.

The Spectrum of Hydrogen.—With the purpose of elucidating the connection between the "four-line" spectrum and the "many-line" spectrum of hydrogen, Mr. Louis A. Parsons, of the Johns Hopkins University, has made a series of experiments dealing with the spectrum of hydrogen obtained under many various conditions, and has embodied his results in a paper communicated to No. 2 vol. xviii. of the *Astrophysical Journal*.

After discussing the various theories which have previously been put forward in explanation of the phenomena, and dealing especially with that of Prof. Trowbridge, who supposes that the line spectrum is due to water vapour, and not to hydrogen pure and simple, Mr. Parsons describes the various pieces of apparatus he used and the experiments he performed, and then summarises his results in the following conclusions:—(1) The compound spectrum never occurs without the line spectrum, although the latter may occur alone at high pressures; (2) the line spectrum is characteristic of an abruptly oscillatory discharge, whilst the compound spectrum is produced by the continuous discharge; (3) the line spectrum may be produced by high temperatures occurring *locally* at points where the disruptive dis-